ABSTRACT

THESIS: Recursive Forecasting and Ordinal Statistical Models from Accelerometer Data

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Accelerometers are devices that measure acceleration along x-, y- and z-axes. These devices can be worn and used to predict activity intensity. The accuracy of conventional accelerometer analysis methods is sub-optimal but newer, more advanced methods that use raw data from the accelerometer for the prediction of activity intensity have been developed. As responses are correlated sequentially and collected over time, time-series methods can be considered to improve prediction accuracy. Prior responses, however, are not available at the testing stage or in practice. However, in testing, prior predictions can be used as in place of lagging responses on models which were built to use lagging responses as observations. This approach is known as recursive forecasting and applying it to accelerometer data is a unique approach in the literature. In addition, until recently, decision models for accelerometer data did not take into account the ordinality of the responses (for example, sedentary, moderate, and vigorous). This is significant information that we consider in this thesis. In this research, we develop more accurate decision models for predicting activity intensity from accelerometer data by using recursive forecasting. We also consider ordinal statistical models. Measuring activity intensity objectively is a crucial consideration in physiology and exercise science and these methods can be implemented in these disciplines to improve such measurement.